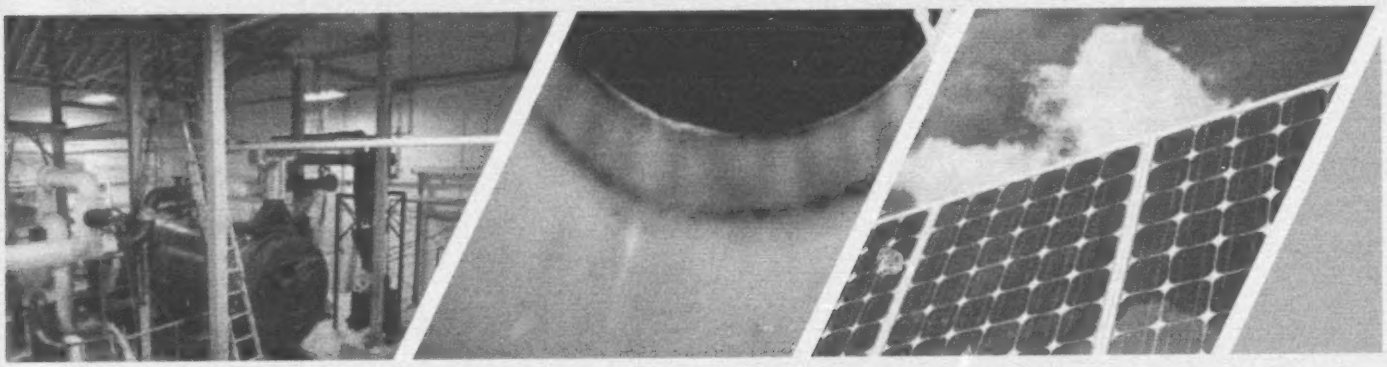
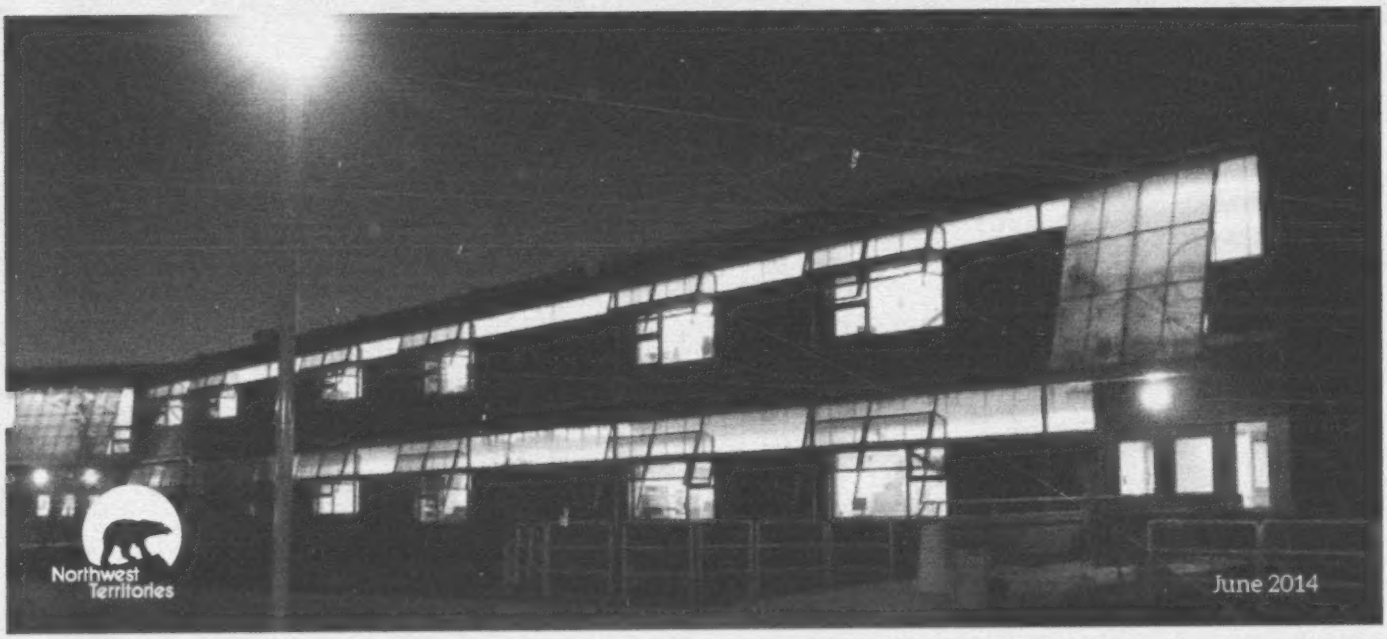
Public Works and Services Energy Conservation Projects

Annual Report 2013-2014





June 2014

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English

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French

Kîspin ki nitawihtîn ē nīhīyawihk ōma ācimōwin, tipwāsinān.

Cree

TŁĮCHǪ YATI K'ĘĘ. DI WEGODI NEWǪ DÈ, GOTS'O GONEDE.

Tłı̨chǫ

ʔERIHTŁ'ÍS DENE SÚLINÉ YATI T'A HUTS'ELKÉR
XA BEYÁYATI THEʔA ʔAT'E, NUWE TS'ÉN YÓŁTI.

Chipewyan

EDI GONDI DEHGÁH GOT'ĮE ZHATĮE K'ĘĘ EDATŁ'ÉH
ENAHDDHĘ NIDE NAXETS'Ę EDAHŁÍ

South Slavey

K'ÁHSHÓ GOT'ĮNE XƏDƏ K'É HEDERI
ʔEDĮHTŁ'É YERINIWĘ NÍDÉ DÚLE.

North Slavey

Jii gwandak izhii ginjìk vat'atr'ijąhch'uu zhit
yinohthan jì', diits'àt ginohkhìi.

Gwich'in

UVANITTUAQ ILITCHURISUKUPKU INUVIALUKTUN, QUQUAQLUTA.

Inuvialuktun

ᑕᕐᔪᐊ ᑎᑎᖅᑐᑦ ᐱᓕᒍᔪᕐᑦ ᐃᓄᖅᑎᑐᓪᓗᒍᑎᓕᓄᖅ,
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Inuktitut

Hapkua titiqqat pijumagupkit Inuinnaqtun, uvaptinnut hivajarlutit.

Inuinnaqtun

Official Languages Division: (867) 920-6484
Francophone Affairs Secretariat: (867) 920-3107

Minister's Message

The Government of the Northwest Territories (GNWT) supports a wide variety of energy initiatives through: the NWT Energy Action Plan, the NWT Greenhouse Gas Strategy, the NWT Solar Energy Strategy and the NWT Biomass Energy Strategy. With our northern environment, energy conservation, efficiency and management are important elements in controlling costs and supporting effective and efficient program delivery in all communities of the Northwest Territories (NWT).

Over the past five years, the department of Public Works and Services (PWS) has been given the opportunity to implement numerous energy efficiency and alternative energy activities to help manage energy needs for public buildings. Our investments in energy efficiency and alternative energy are reducing our dependence on fossil fuels, are lowering our operating costs and are helping us meet our greenhouse gas emission reduction goals.

Beginning in 2007, the GNWT's investment in energy improvement and alternative energy projects, such as biomass for space heating, have generated savings of over $5.8 million. With the completion of projects currently underway, the GNWT will be on track to meet 30% of its total space heating load for PWS managed assets through biomass energy. As a result of the success of these investments, the GNWT is now able to reinvest demonstrated operational savings from our energy initiatives to fund future energy conservation and alternative energy projects throughout the NWT.

In 2013/14, the GNWT reduced the consumption of fossil fuels by over 2.8 million litres, and 33% of the total energy use for public buildings, managed by Public Works and Services, is being provided by renewable energy sources. Cumulative reductions in heating oil since 2007 total 12.85 million litres, equivalent to 35,086 tonnes of GHG emissions. The GNWT has re-profiled $1.48 million in utility funding and is projecting to reach $1.72 million by the end of 2014/15.

Working with our partners in industry and other levels of government, the GNWT continues to be a leader in the development and implementation of cost effective biomass energy solutions for public infrastructure. We looks forward to continuing to build upon the success of our energy strategies and investments by expanding our use of renewable energy and continuing to improve the management of our energy needs.

The Honourable

Tom Beaulieu

Minister of Public Works and Services

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Executive Summary

The department of Public Works and Services (PWS) is responsible for operating and maintaining the majority of the Government of the Northwest Territories' (GNWT) building assets in 33 NWT communities. In 2013/14 the GNWT's utilities budget, administered by PWS, was $30.8 million which went towards the needs of 576 assets.

In recent years, PWS has taken a leading role in the adoption of energy conservation and renewable energy technologies, as well as good building practices for the northern environment. Through its energy conservation activities, the department is helping the GNWT meet its goals to operate as effectively and efficiently as possible and reduce greenhouse gas emissions by pursuing sustainable development. These activities including energy retrofitting and energy efficient design and construction have helped reduce the average energy intensity (kWh/m^2) of NWT schools by 15% since 2006/07.

This is the fourth PWS Energy Conservation Projects Annual Report. It details the results of past projects, lessons learned and planned future projects, including anticipated results in terms of overall reductions to greenhouse gas emissions, reductions in need for traditional energy sources and reductions to costs associated with operating and maintaining GNWT facilities.

In 2013/14, Public Works and Services delivered 16 energy conservation projects in eight communities across the NWT.

PWS was able to source 30% (20% hydro electricity, 10% wood pellets) of the energy needs for facilities we manage from renewable sources such as hydroelectricity and biomass. The associated annual greenhouse gas reductions attributed to energy conservation projects to the end of 2013/14 was 7,873 tonnes, or 19% of the GNWT's annual total. GNWT biomass projects completed to date contributed 62% of the GNWT's total annual reduction in GHG emissions.

With major facilities in every community across the NWT, the two program areas with the highest energy demands are education at 37% and health and social services at 29% of the GNWT's annual utility budget. As such, PWS focuses much of its energy conservation and renewable energy investments on these facilities.

In 2014/15 PWS plans to:

- Bring online eight biomass systems in the communities of Norman Wells, Yellowknife, Hay River and Fort Resolution.
- Complete energy retrofits in Yellowknife and Fort Smith which will be based on previously completed energy audits.
- Complete four building envelope upgrades to GNWT facilities in Yellowknife, Paulatuk, Sachs Harbour and Fort Smith.
- Upgrade residual heat equipment at the Chief Julius School in Fort McPherson.

Through to the end of 2013/14, energy conservation projects since 2007 will have reduced the need for the equivalent of 12.85 million litres of heating oil, reduced cumulative GHGs by 35,086 tonnes and have saved the GNWT approximately $5.8 million. These savings have allowed the GNWT to re-profile $1.48 million of annual utility funding for the use on future energy conservation projects.

Introduction

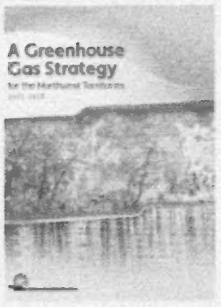
The Government of the Northwest Territories (GNWT) is committed to the responsible use of energy and to the reduction and mitigation of the effects of its energy use on the environment. Through its activities, the department of Public Works and Services (PWS) plays an important role in helping achieve the GNWT's goals and commitments as set out in the NWT Energy Action Plan, the NWT Greenhouse Gas Strategy and the NWT Biomass Strategy.

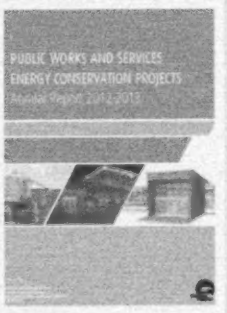
PWS is responsible for the operations and maintenance of the majority of the GNWT's building assets and also project manages many large capital projects on behalf of client departments. This makes the department uniquely positioned to engage in many energy conservation activities and strategies for responsible energy management. These include:

- commissioning construction projects to ensure peak performance and occupant comfort,
- conducting energy audits and energy-efficiency retrofits on existing buildings, and
- using renewable energy sources like biomass and hydro-electric energy.

In 2013/14 the utilities budget for the GNWT assets that PWS maintains was over $30 million. Ensuring that buildings are designed, maintained and retrofitted to be as energy efficient as possible and to remain operational for their full designed lifespan is critical to achieving our government's goal of being as efficient and effective as possible. With this in mind, PWS continues to focus many of its energy management activities around reducing our government's dependence on heating oil, reducing operating costs and lowering GHGs through smart design and incorporation of renewable and energy efficient solutions.

This annual report details the ongoing results from PWS energy conservation activities and expected results for future projec





Phase 1 of the envelope upgrade at the Stuart Hodgson Building in Yellowknife. Thermal insulation levels were increased to RSI of 5 and leakage rates are being improved through the use of spray foam insulation. The building will also receive new cladding.

Energy Saving Activities

Public Works and Services operates and maintains the majority of GNWT facilities. As managers of GNWT building assets, PWS is continuously looking to invest in energy saving measures to help increase efficiency, increase the useful life of an asset, reduce greenhouse gas (GHG) emissions and reduce operating costs and improve occupant comfort.

Through the adoption of biomass technology, the Capital Asset Retrofit Fund (CARF), electric heat conversions and energy efficient design, we are achieving expected results.

In addition to increasing the energy efficiency of existing assets, PWS also focuses on the efficient design, proper construction, and commissioning of new and renovated buildings. Efforts continue to ensure that new capital projects are constructed and operate as designed, which increases the longevity and lowers life cycle costs of the GNWTs growing asset base. For example, the new East 3 School in Invik (2012) uses 47% less energy than the two schools it replaced.

Biomass

Since the installation of the first biomass boilers at the North Slave Correctional Facility in Yellowknife in 2007, the GNWT has seen significant reductions in greenhouse gas emissions. This proven technology can offset the annual fossil fuel usage of a facility by up to 90%. To date, the GNWT has installed 15 biomass boiler systems in communities throughout the North Slave, South Slave and Deh Cho regions (detailed in Appendix A).

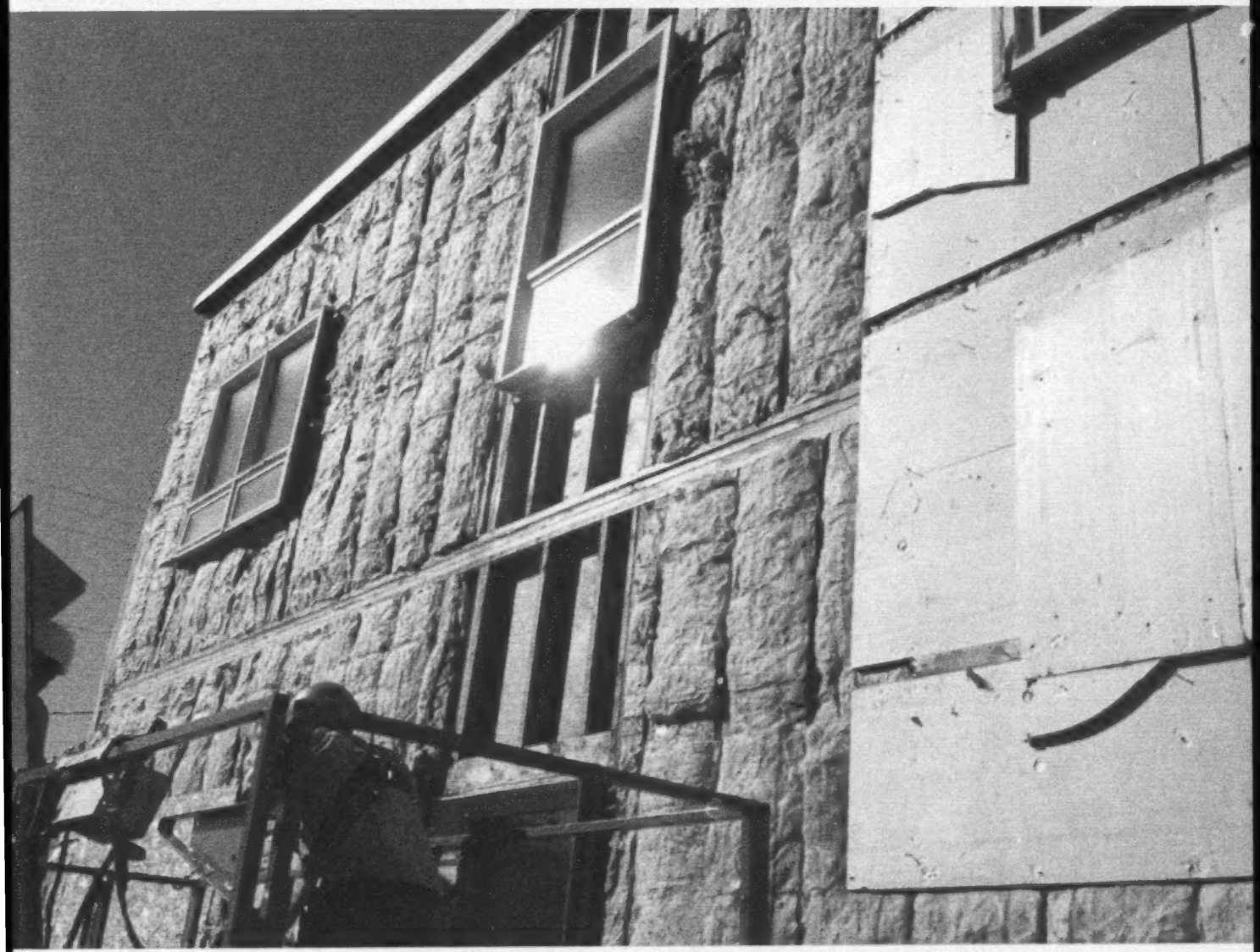
In 2013/14, three new biomass boiler projects were initiated in Norman Wells at the Mackenzie Mountain School, Airport Terminal Building and Airport Maintenance Garage. These new boilers are scheduled to be operational by the end of summer 2014 and ready for the 2014/15 heating season. It is anticipated that these projects will further reduce the GNWT's annual GHG emissions by approximately 391 tonnes. The use of wood pellets in Norman Wells has increased since the installation of a storage facility and delivery truck to serve commercial wood pellet boilers.

In addition to the Norman Wells biomass installations, a number of new GNWT capital projects, also under construction, will incorporate a biomass boiler for base load heating. These projects include the new office building in Yellowknife which will provide biomass heat to the adjacent Stuart Hodgson and Arthur Laing Buildings and, the new health centres in Hay River and Fort Providence. These three projects will reduce annual GHG emissions by an additional 1,467 tonnes.

Results

In 2013/2014, the 15 biomass boiler installations helped reduce GNWT greenhouse gas emissions by approximately 4,882 tonnes of GHG emissions. These projects also produced approximately $594,000 in operational savings in heating costs by displacing higher cost heating oil and propane.

The Capital Asset Retrofit Program, in conjunction with the Deferred Maintenance Program, often undertakes the upgrading of building envelopes. These projects typically consist of upgrading exterior insulation values, replacing windows and replacing failed exterior cladding.



Capital Asset Retrofit Fund (CARF)

Following the release of the GNWT's Energy Action Plan in 2007, the Capital Asset Retrofit Fund Program was created to improve the energy efficiency of existing GNWT assets. This program helps minimize the effects of rising utility costs of the GNWT's aging infrastructure and lessen our reliance on imported fossil fuels. In most cases, energy retrofits and projects delivered under CARF help increase the useful life of a facility and/or its equipment.

Through the use of energy benchmarking and auditing, thermal scanning and feedback from operation and maintenance staff, buildings are identified for energy retrofit projects. Typical energy efficiency retrofit projects would include:

- Envelope upgrades
- Lighting upgrades
- Heating control optimizations
- Ventilation optimizations
- Efficient-water fixtures
- Re-commissioning/re-balancing of aging systems

PWS monitors and tracks the success of energy retrofit projects with respect to GHG reductions and utility cost savings. The CARF Program enables the GNWT to re-profile savings from energy retrofit projects to capital funding. By doing this, the GNWT can continue to make capital investments year after year to fund energy related activities. Since 2010/11, the GNWT has re-profiled a total of $1.5 million from the annual utility budget to capital funding.

In addition to the projects completed under the CARF Program, there are a number of energy retrofit activities which assist in reducing GHG emissions. These include major mid-life retrofit projects funded by the GNWT's capital plan and residual heat projects which utilize heat from Northwest Territories Power Corporation generators to heat GNWT assets. A complete list of all energy retrofit activities can be found in Appendix A.

CARF projects from 2013/14 fiscal year include:

- Three LED lighting pilot projects were completed to determine their effectiveness in high bay lighting applications (GNWT Warehouse, Yellowknife), exterior LED lighting (North Slave Correctional Facility, Yellowknife) and runway lighting (Lutselk'e Airport).
- Large retrofits in a number of schools across the NWT were completed: Grandfather Ayha School (Deline), Chief Jimmy Bruneau School (Behchokǫ̀).
- Two energy retrofits were underway Bompas School and Thomas Simpson School (Fort Simpson), completion in 2014/15.
- A full mid-life retrofit of the Milton Office Building in Fort Simpson was completed which included the envelope and mechanical equipment.
- Phase 1 completion of the envelope upgrade at the Stuart Hodgson Building in Yellowknife.

Results

Completed energy retrofit activities contributed to the reduction of approximately 2,269 tonnes of GHG emissions in 2013/14. This represents an operational savings of approximately $890,000. These reductions are a combined result from completed CARF retrofits, mid-life retrofits and residual heat projects.

Spotlight – Light Emitting Diode (LED) Pilot Projects

In the fiscal year of 2013/14, three pilot projects using LED technology were completed. These projects involved the installation of exterior LED lighting at the North Slave Correctional Facility (NSCF) in Yellowknife, high bay lighting at the PWS Warehouse in Yellowknife and a LED conversion of runway lights at the Lutsel K'e Airport.

PWS took readings before and after the installations on the lighting circuits to measure the direct reduction in electricity consumption. The following results were found.

Exterior LED Lighting, NSCF

Twenty two units were installed in the 2013/14 fiscal year. Lights were grouped in quantities that would display how the new LED style lights would function as a group. The intent was to measure the before and after consumptions on the lights and obtain input from NSCF staff on whether or not these groupings of lights would work for their program needs.

Current draws (amps) were measured on a number of different lighting circuits with the following results shown in Table 1.

New LED wal pak lights installed at NSCF

Table 1: Current Draw in amps comparisons for 7 different lighting circuits at the NSCF

Number of Fixtures	Amps (Metal Halide)	Amps (LED)	Reduction (%)
3	5.2	2.2	58%
3	5.2	2.2	58%
3	5.2	3.0	42%
5	8.75	4.7	46%
3	5.25	2.5	52%
2	3.5	2	43%
3	5.8	2	65%

On average, these LED lights reduced the power consumption by 51%. In addition to the reduction in energy, the effectiveness of the lights was not affected. In most cases, it is difficult to even tell which lights were retrofitted. The lights will operate in cold temperatures and have instant on capabilities.

Interior High Bays, PWS Warehouse

Prior to the installation of the LED high bay lighting, PWS staff took power readings and light level measurements in specific sections of the loading bay area. The purpose was to ensure that light levels would not be reduced once the new LED lights were installed.

Old metal halide lights

The new LED lights consumed approximately 56% less energy than the old metal halide fixtures. The average lighting was increased by 44%. When comparing the lighting levels of the old and new fixtures it is important to note that the new LED fixtures are at their brightest with minimal hours of operation compared to the metal halide fixtures which had been in service for some time.

New LED lights with higher illumination levels than before

LED fixtures provide significant reductions in maintenance costs as they are reported to last for approximately 100,000 hours compared to the 20,000 hour life of metal halides. Also, at the 100,000 hour mark, these LED lights are said to still be able to produce approximately 80% of their initial lumens; meaning that if light levels are still appropriate, these LED fixtures can last for a much longer time.

One surprising figure is the reduction in energy use achieved by installing the LED lights compared to their ability to maintain light levels. These two installations will see a payback in approximately 4.5 years which does not include any maintenance cost savings. If these fixtures last as long as specified, they will significantly decrease the operation and maintenance costs of maintain the lights in these two facilities.

Electric Heat Conversions

In an effort to maximize the use of hydro power produced from the Taltson Dam, the GNWT and the Northwest Territories Power Corporation completed four electric boiler projects in Fort Smith starting in 2008. These electric boilers use the excess power generated from the Taltson Dam, on an interruptible basis.

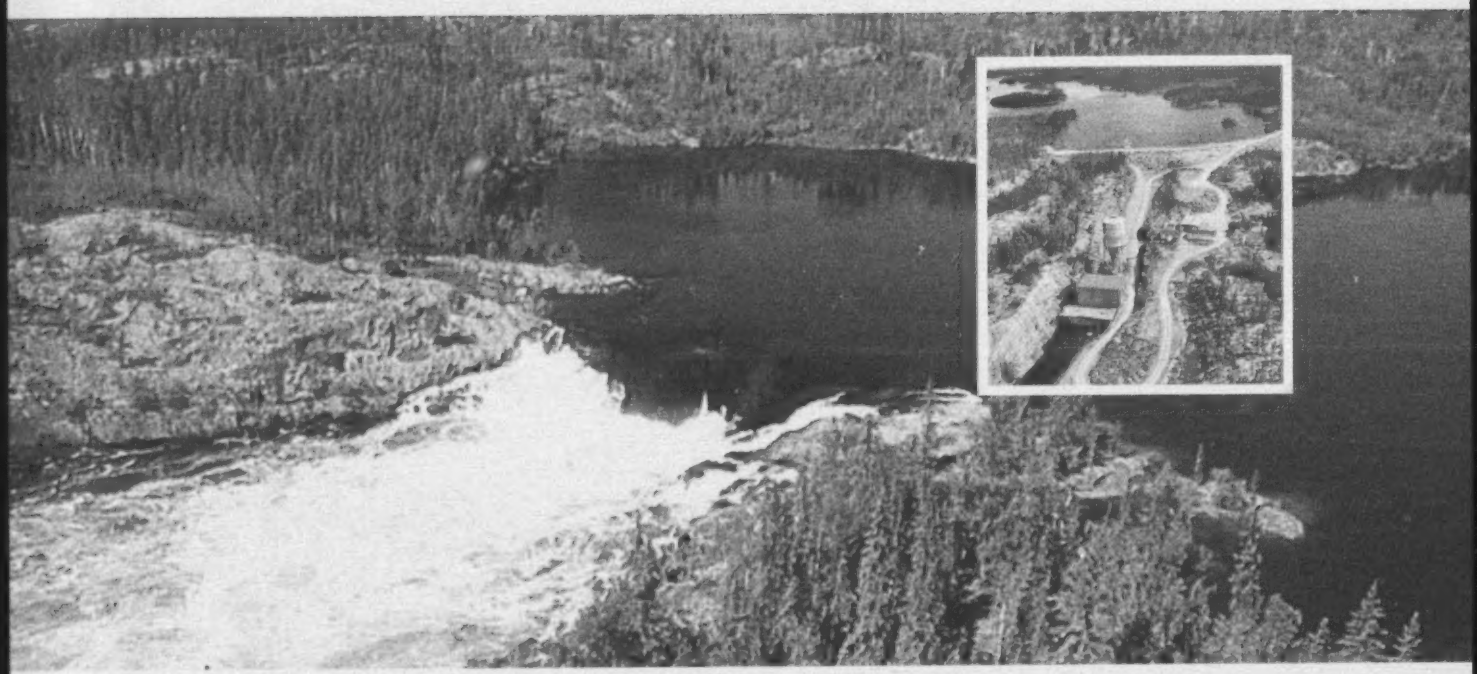
The first two buildings to be retrofitted were the J.B. Tyrell Elementary School and Breynat Hall in 2008, followed by the department of Transportation's Highways Maintenance Garage in 2009 and finally the Northern Lights Special Care Home in 2012.

Results

In 2013/14, these four electric boiler projects displaced 722 tonnes of GHG emissions. The use of interruptible hydro power in these buildings resulted in savings of $283,000. Additionally, the reduced maintenance requirements on the electric boilers means less time spent doing routine maintenance on the boiler plants in those buildings.

In collaboration with NTPC, PWS will continue to seek out hydroelectric power opportunities where they exist.

The Taltson hydro generating station produces the electric power for communities in the South Slave Region. Four GNWT assets are using this hydro power on an interruptible basis for space heating, reducing the need for heating oil.



Energy Efficient Design

An important role of PWS is to ensure that new GNWT facilities and retrofit projects are being designed as energy efficiently as possible and to incorporate, where appropriate, new energy efficient technologies as they emerge. From national code development to the commissioning of northern facilities, the day-to-day activities of the Design and Technical Services division have a direct impact on how buildings are designed, constructed and use energy in the North.

Good Building Practice for Northern Facilities (GBP)

The department has created and continually updates its own design guidelines, the GBP, to make sure that new buildings and additions are 10% more energy efficient than that of a base building built to the 2011 National Energy Code for Buildings. Energy modeling workshops, along with the application of the GBP help make it easier for PWS to work with its partners to meet the high energy efficiency standards it has set while not compromising the design and lifecycle of a building. An update to the GBP will be required to reflect the new 2015 NECB, once it comes into effect.

Performance Verification and Commissioning

Commissioning of a project requires that PWS staff verify that a building is a code-compliant, healthy and comfortable environment for occupants and is built to operate at peak efficiency. Staff also do functional performance checks of new installations to make sure that everything from boilers to heating, ventilation and air conditioning systems are installed and operating correctly, as per their original design plans. Commissioning and performance verification help ensure that new buildings and additions reduce the GNWT's energy consumption, operation costs and GHG emissions.

Recommissioning involves a renewal of heating, ventilation and air conditioning systems back to their original design set points. Over time, there is a tendency for systems to drift from design and can result in increased energy usage. A re-commissioning will ensure all equipment is functioning as intended, on schedule and at targeted design values.

Energy Modeling

In an effort to optimize our capital investments, PWS requires that all large facilities follow a design review process which includes an energy modeling workshop. These workshops bring together everyone from builders, to the end users, to discuss the purpose of the building and how to design it to meet all program requirements, as energy efficiently as possible. By bringing all stakeholders together, new energy efficient options can be discussed and incorporated into designs without hindering the facility's ability to meet the needs of its users or prolonging the project's delivery schedule.

Code Development

PWS technical staff participate in many national energy-related code development committees including:

- the National Research Council Standing Committee for Energy Efficiency in Buildings which will inform code changes to the 2015 National Energy Code for Buildings,
- the Canadian Standards Association Technical Subcommittee looking at building energy estimation methodology,
- the Public Infrastructure Engineering Vulnerability Committee looking at the impact of climate change on northern engineered infrastructure,
- the Building Technology Transfer Forum, and
- assisting with the development of ASHRAE Cold Climate Design Guide which is due out in 2014.

Providing a northern voice and technical expertise on these development committees is crucial to the future success of energy conservation projects for the GNWT. Many of the standards, including the upcoming 2015 Canadian National Energy Code for Buildings (NECB) will dictate future projects and performance measures.

Spotlight - Energy Efficient Design

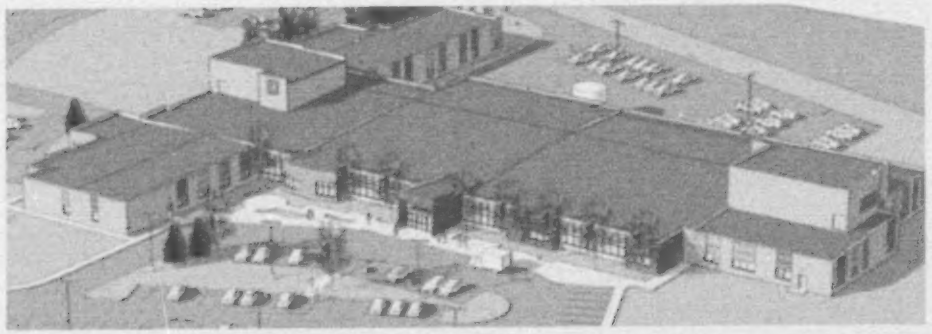
East 3 School Update

In its first full year of operation, the new East 3 School in Inuvik has reduced the need for approximately 92,000 kWh of electricity and 7,998 GJ of heating energy compared to consumption rates from the old Samuel Hearne and Sir Alexander Mackenzie schools.

East 3's heating intensity of 0.69 GJ/m^2 is 47% less than the combined heating intensities of the two old schools.

Energy savings at the new school are a result of the use of energy efficient boilers, heat recovery systems, improved insulation, HVAC controls and efficient lighting. These reductions in heating and electricity use are equivalent to reducing GHG emissions by approximately 474 tonnes.

New Construction, Hay River Health Centre



The new Hay River Health Centre will be a 6,800 m^2 state of the art health care facility. It is being constructed to replace the existing H.H. Williams hospital which has reached the end of its useful life. Construction of the new Health Centre began in March 2013.

The GBP, the department's own building design standard, ensures that new buildings and additions built by PWS are at least 10% more energy efficient than a base 2011 NECB building. By ensuring that retrofits, additions and new facilities incorporate the most energy efficient design features and technologies as possible, PWS is maximizing return on investment by lowering the operations and maintenance costs of buildings, greenhouse gas emissions and fuel oil use.

Energy efficiency measures in the design of this new Health Centre include:

1. Heat recovery on ventilation equipment
2. Demand control ventilation
3. Full heating and ventilation controls package
4. High efficiency propane boilers
5. Efficient lighting design (photocells, timers, occupancy sensors)
6. Optimized exterior insulation levels
7. A 1.2 MW biomass boiler included for base load heating

Energy modelling of the new facility has confirmed that it has been designed to be 28% more energy efficient than a base building constructed to the 2011 NECB.

Energy Project Performance at a glance

Public Works and Services has been tracking energy conservation projects and activities since 2007 to measure and report on the progress the GNWT is making to reduce greenhouse gas emissions. These projects include:

- 15 biomass projects, specifically wood pellet boilers
- Four electric boilers which use excess power in Fort Smith
- Three residual heat projects which utilize heat created from NTPC generators
- Numerous energy retrofits

2013/14 fiscal year

In 2013/14, GNWT energy conservation projects reduced the need for the equivalent of 2.8 million litres of heating oil. This represents a greenhouse gas emission reduction of 7,873 tonnes. A breakdown of savings in 2013/14 by type of project is provided in Figure 1.

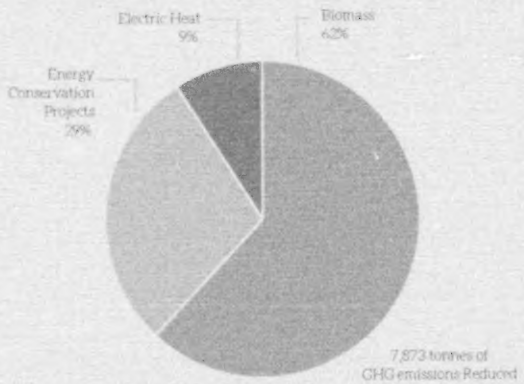


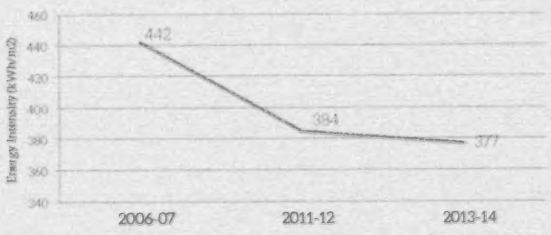
Figure 1: 2013/14 Greenhouse Gas Reductions broken down by project type

The anticipated target for GHG reductions in 2013/14 was estimated to be 9,492 tonnes in the 2012/13 annual energy report. Optimization work continues on existing installations and PWS is expecting target reductions to be met in the 2014-15 fiscal year.

Spotlight - The Energy Intensities of NWT Schools

The energy intensity of NWT schools has shown a downward trend since 2006/07. Energy efficient design and construction of new schools through the use of the GBP, energy modelling and commissioning, in combination with energy retrofit activities PWS undertakes, helps to mitigate the general trend of rising energy consumptions from aging infrastructure.

With NWT Schools making up such a large portion of GNWT owned floor space, they are a major focus for energy efficient retrofits. Since 2006/07, the average energy intensity of schools has been reduce by 15%.



Previous Years' Performance

Investments in energy conservation projects have had a significant impact on the GNWT's operation costs and GHG emissions. The use of biomass boilers has had the largest direct effect on reducing greenhouse gas emissions. Both biomass heat and the use of electric heat in Fort Smith have made it possible for the GNWT to make a wholesale switch off of fossil fuels to cleaner, renewable heating sources.

The effects of these activities on GHG emissions can be seen in Figure 2 which shows the annual reductions in greenhouse gas emissions for the past six years of monitoring. The use of biomass boilers has had the most significant impact to GHG emission reductions, contributing 75% of the total cumulative GHG reductions since 2007. Cumulative savings since 2007 total 12.85 million litres of heating oil, equivalent to 35,086 tonnes of GHG emissions.

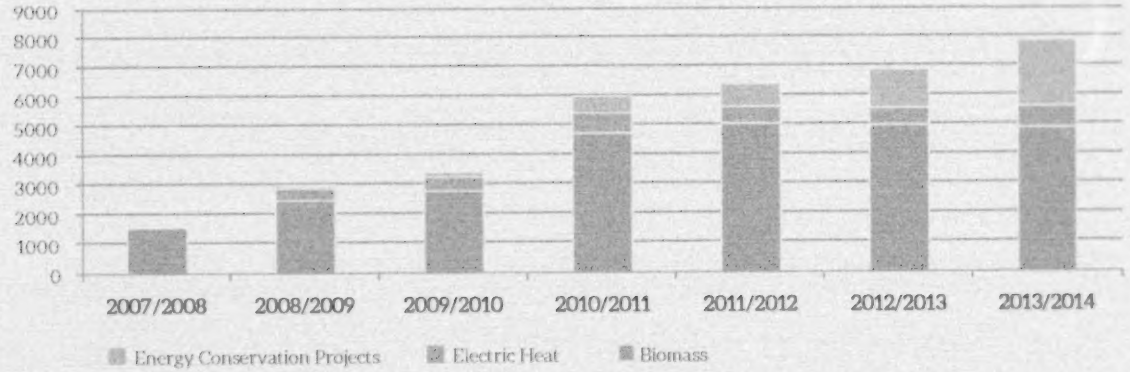


Figure 2: Annual reductions in greenhouse gas emissions since 2007

Spotlight - Lessons Learned

Biomass Optimization – Different building types respond differently when heated with large biomass boilers. One size does not always fit all and systems need to be properly tuned on a case by case basis.

Learn from the Success/Failures of Others – Building off the success of the Housing Corporation's solar PV installations, PWS will be delivering a solar PV project using information from NWTHC's design build documentation.

Training – Regardless of the technology, however simple or complex, training for staff is imperative. Proper training increases user confidence, helps increase operation efficiency and leads to longer lasting systems/equipment.

Tracking Information – The reconciliation and consolidation of utilities to PWS in 2010/11 has increased the ability for the GNWT to track and report on the performance of its assets. Efficiencies have been gained with respect to completing asset inventory adjustments and other utility budget activities in the GNWT.

Utility Analysis

The consolidation of GNWT utility payments within PWS has improved the ability to track expenditures and seek opportunities to improve its utility budget bottom line.

In 2013/14 the GNWT spent a total of $30.8 million on utilities for 576 assets in 33 communities. Figure 3 is a breakdown by utility type of these payments.

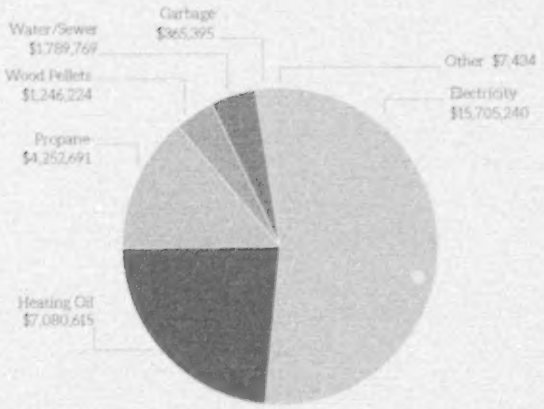


Figure 3: 2013/14 utility budget broken down by type.

One major difference in 2013/14 as opposed to previous years' expenditures is the absence of natural gas in the utility budget. As a result of the shortage of natural gas in Inuvik, all GNWT facilities were switched to synthetic natural gas (produced from propane), propane or heating oil for a significant portion of the year. The GNWT also converted all GNWT facilities to heating oil or propane in Norman Wells in anticipation of the termination of natural gas services for all customers by October 2014.

The cost of electricity made up 51% of the GNWT's total annual utility budget in 2013/14, but only made up approximately 26% of the GNWT's total energy usage as seen in Figure 4. When compared to the previous fiscal year's utilities, 2013/14 saw a further reduction in fossil fuel use.

There are many factors which contribute to the overall annual energy usage of GNWT facilities such as reductions from energy projects, weather, forced growth, building operation, building occupancy rates, etc. The continued implementation of energy efficiency activities will help further reduce the GNWT's energy consumptions.

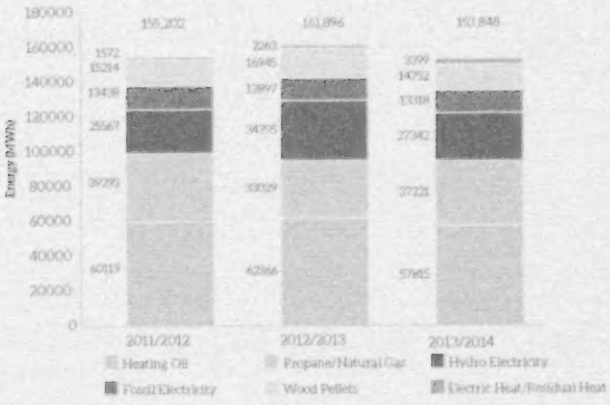


Figure 4: Energy use comparison between fiscal years.

Of the total 153,847 MWh (full) of energy used in 2013/2014, approximately 30% was produced from renewable energy sources (hydroelectricity, wood pellets).

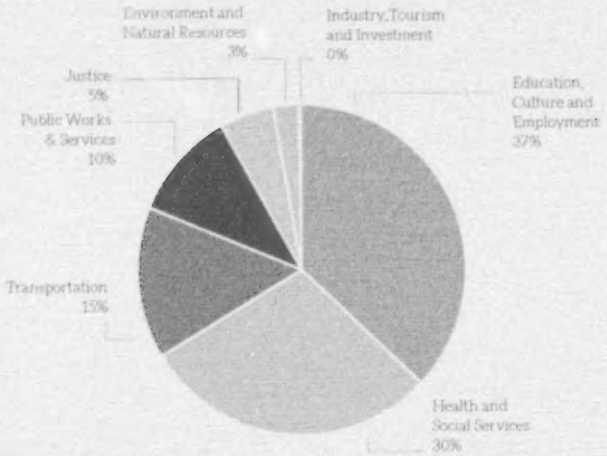

Environment and Natural Resources 3%
Industry, Tourism and Investment 0%
Justice 5%
Education, Culture and Employment 37%
Public Works & Services 10%
Transportation 15%
Health and Social Services 30%

Figure 5: 2013/14 utilities split by GNWT department

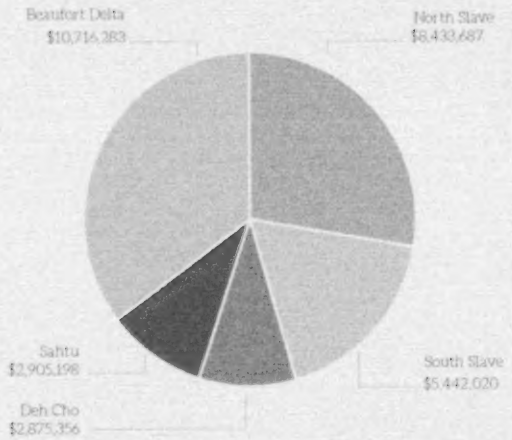


Figure 6: 2013/14 utility expenditures broken down by region.

The departments of Education, Culture and Employment and Health and Social Services account for 60% of the GNWT's total owned floor space. Two thirds of the 2013/14 utility budget was spent on facilities belonging to these departments as seen in Figure 5.

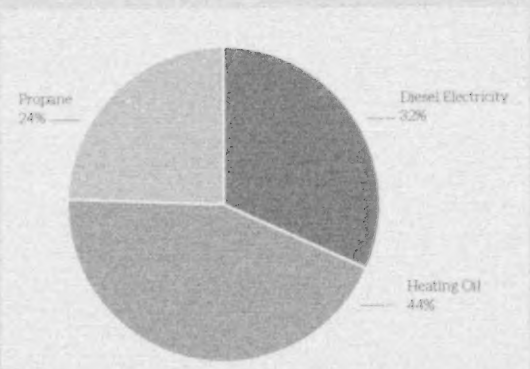
Figure 6 shows the 2013/14 utilities split by region. As in past years, the Inuvik region is the most expensive region for GNWT utilities. Inuvik region has a large number of GNWT assets combined with some of the highest heating fuel and electricity prices and very challenging environmental conditions.

Greenhouse Gas Emissions

In 2013/14 GNWT Greenhouse gas emissions from building assets produced a total of 32,820 tonnes of equivalent CO_2.

GHG emissions were produced from the burning of fossil fuels for heating (heating oil, propane) and electricity (diesel fired power).

Energy efficiency projects in 2013/14 reduced GHG emissions by 7,873 tonnes, representing a 19% reduction in total GHG emissions.



Planned Activities for 2014/15

Building on our success, the GNWT plans to invest in several new energy conservation and renewable energy projects in 2014/15.

- Eight biomass systems will be brought online for the 2014/15 heating season
  - » Mackenzie Mountain School, Norman Wells
  - » Airport Terminal Building, Norman Wells
  - » Combined Services Building, Norman Wells
  - » New Office Building, Yellowknife
  - » Airport Terminal Building, Yellowknife
  - » Prince of Wales Northern Heritage Centre, Yellowknife
  - » South Mackenzie Correction Centre, Hay River
  - » Deninu School, Fort Resolution
- Energy retrofits will be completed at the Legislative Assembly Building (Yellowknife), North Slave Correctional Facility (Yellowknife), Breynat Hall (Fort Smith), Northern Lights Special Care Home (Fort Smith), and PWK High School (Fort Smith). All work to be done will be based on previously completed energy audits of these facilities. An upgrade to the residual heat equipment at the Chief Julius School in Fort McPherson will be done to maximize the effectiveness of this system.
- A solar photovoltaic (PV) system will be installed at the Gamètì Health Centre
- A number of facilities will have envelope upgrades completed including the; Stuart Hodgson Building (Yellowknife), Angik School (Paulatuk), Inualthuyak School (Sachs Harbour) and Thebacha College (Fort Smith).
- Construction has also commenced on the new Health and Social Services Centre and Long Term Care Facility in Norman Wells which includes a new biomass boiler as part of the heating system.
- Feasibility studies for biomass boiler systems in communities not currently using wood pellets commercially will be done to help seed the wood pellet markets.

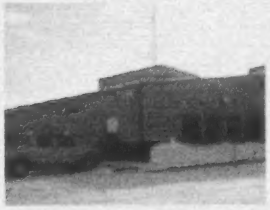
By the end of the 2014/15 fiscal year, PWS is forecasting annual GHG reductions to reach approximately 11,500 tonnes and utility savings to reach approximately $1.72 million. The large number of biomass boilers being completed and coming into service in 2014/15 will provide a significant boost in GHG reductions. PWS will also continue to work on optimizing previously completed energy projects to maximize annual utility savings.

Prince of Wales Northern Heritage Centre, Yellowknife

Size: 300 kW
Fuel Saved: 167,400 liters of heating oil

Deninu School, Fort Resolution

Size: 160 kW (Approx.)
Fuel Saved: 38,526 liters of heating oil



South Mackenzie Correction Centre, Hay River

Size: 220 kW
Fuel Saved: 78,805 liters of heating oil

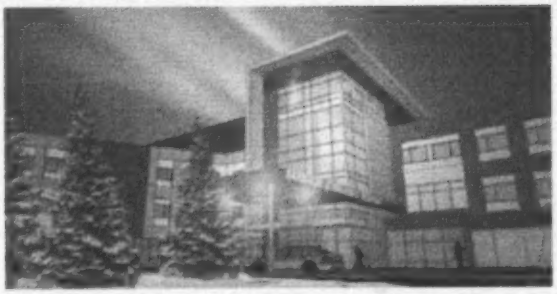
Airport Terminal Building, Yellowknife

Size: 400 kW
Fuel Saved: 297,000 liters of propane

Looking Beyond 2014/15

Energy conservation activities such as large biomass boilers, lighting upgrades, HVAC optimizations and building envelope upgrades have helped improve the energy intensities and reduced GHG emissions on some of the GNWTs' least energy efficient assets. Looking forward, PWS will continue to assess opportunities to complete energy retrofits and look to build off of the success other GNWT departments have had with the use of alternate energy technologies such as solar for electricity and hot water, LED lighting, smaller biomass boiler systems and other emerging renewable energy technologies.

PWS will also look to improve on the requirements for energy efficiency in leased space. The GNWT currently leases approximately 40% of its' space requirements (61,882 m^2). Improvements in energy efficiency requirements for leased space will help motivate building owners to reduce energy consumption and GHG emissions in the NWT and should translate into reduced costs for leased space over time.



Work continues on the re-development of the Stanton Territorial Hospital in Yellowknife. This project will be a large multi-year renovation and addition to the existing facility. Due to the size and specialized requirements of this hospital, Stanton is one of the GNWTs' most costly and energy intense asset. Consequently, the GNWT intends to include many energy conservation measures into the new facility. LED lighting and lighting controls, heat recovery, optimized insulation levels, sophisticated HVAC controls and the installation of a biomass boiler are all being promoted for inclusion in the design of what will be a state of the art healthcare facility. With an anticipated size of 3MW, the proposed biomass system will be the largest in the NWT to date.

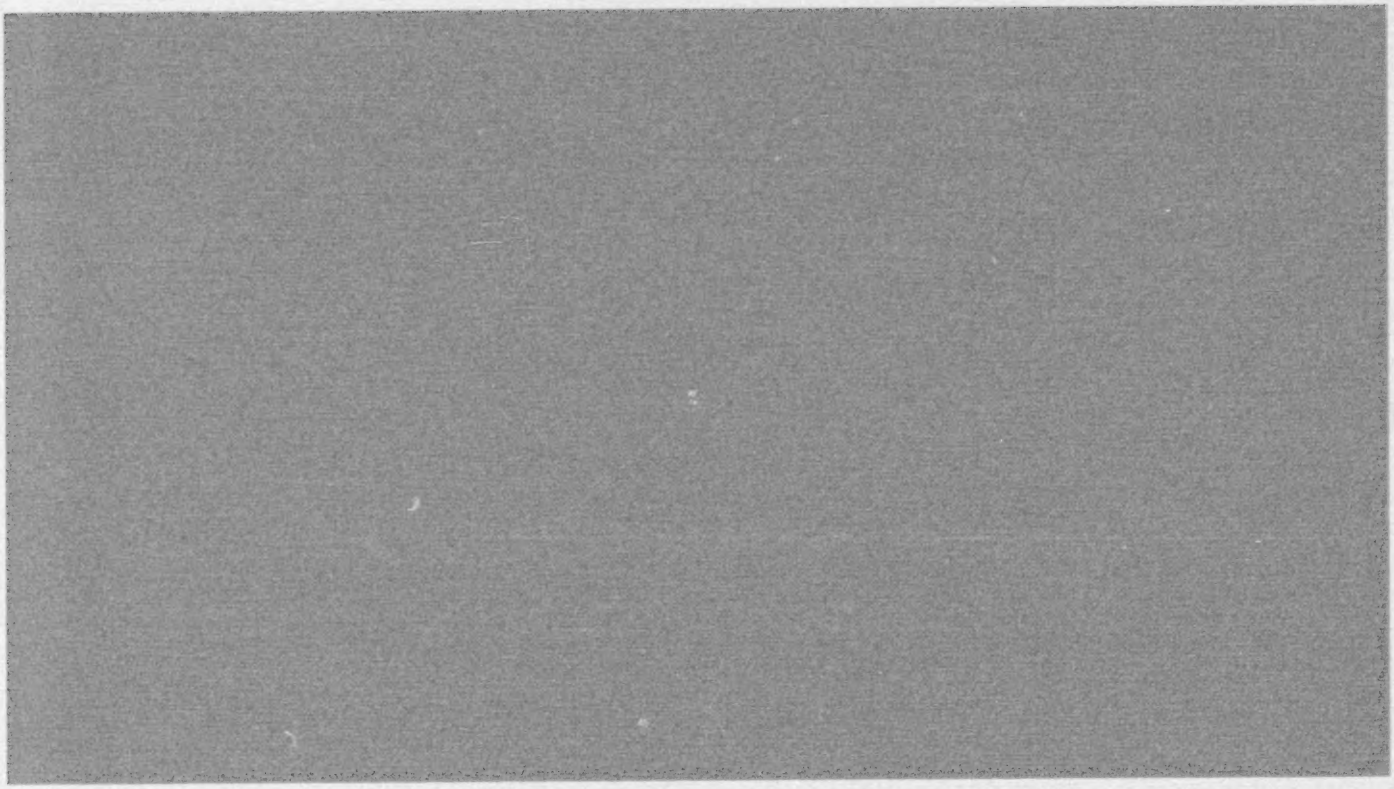
Appendix A: Completed Energy Conservation Projects

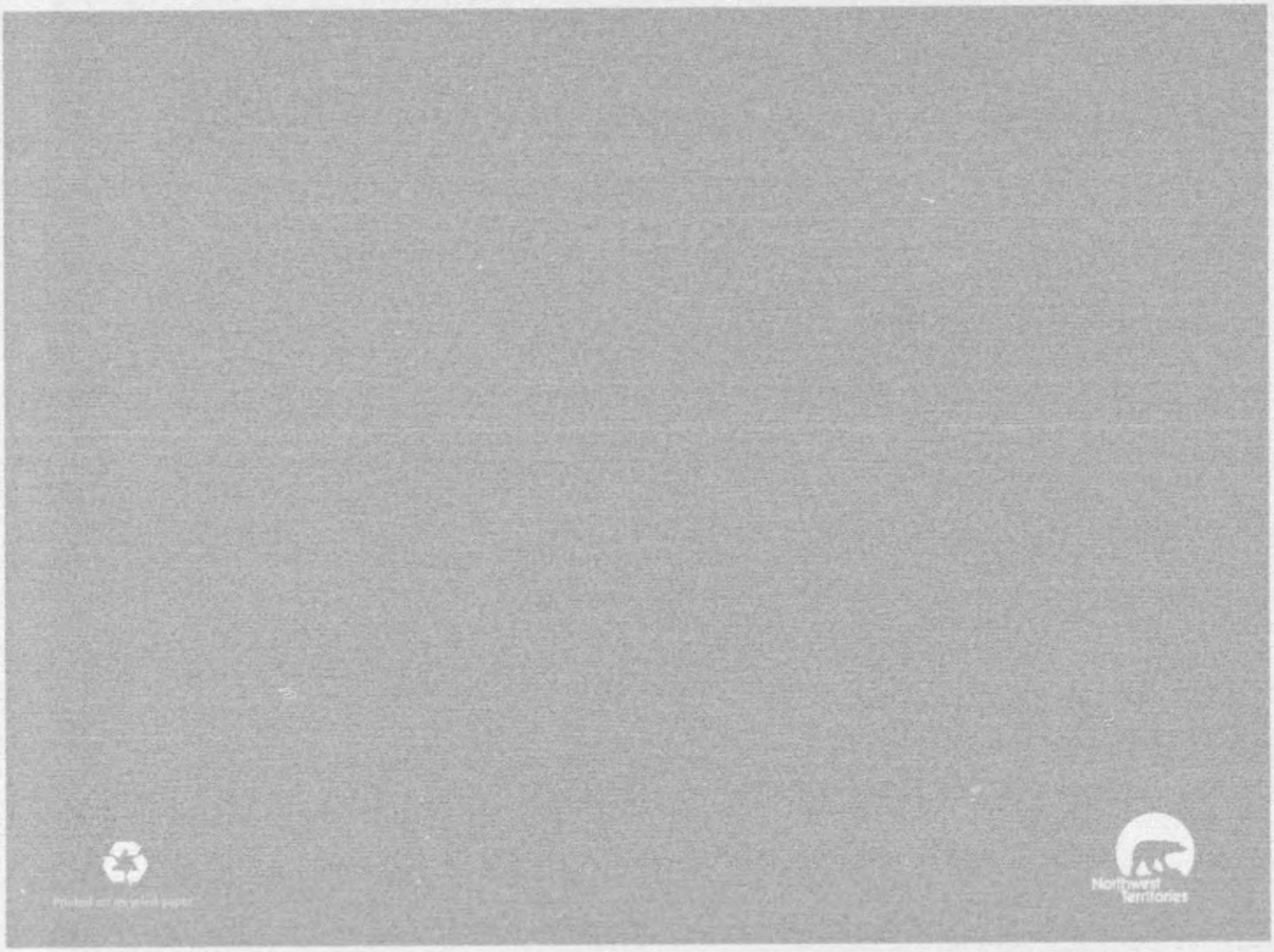
Energy Conservation Projects			
Facility	Community	Description	Service Date
Moose Kerr School	Aklavik	Lighting Upgrade	2013
Air Terminal Building	Aklavik	Lighting Upgrade	2011
Community Learning Centre	Aklavik	Lighting Upgrade	2011
Grandfather Ayha School	Deline	Lighting Retrofit	2011
Harry Camsell	Hay River	Lighting Retrofit (Exit Lights)	2011
Health Centre	Fort Good Hope	Lighting Retrofit	2011
Community Learning Centre	Tuktoyuktuk	Lighting	2011
Health Centre	Tsiigehtchic	Lighting Upgrade	2011
Health Centre	Fort McPherson	Lighting Retrofit	
Health Station	Tuktoyuktuk	Lighting Upgrade	
Health Centre	Sachs Harbour	Lighting Upgrade	2011
Deh Gah School	Fort Providence	Boiler Optimization, Gym Lighting, T12->T8	2010
Inuvik Hospital	Inuvik	Controls Optimization	2011
Nurses Residence	Inuvik	Lighting and exterior upgrade	2011
Maintenance Camp	James Creek	Generator Replacement	2011
Mangilaktuk	Tuktoyuktuk	Lighting and Boiler controller	2011
Stuart Hodgson Building	Yellowknife	Ventilation Upgrade	2012
Thomas Simpson	Fort Simpson	Envelope Upgrade	2012
Thebacha School Retrofit	Fort Smith	Controls Upgrade, Re-Balancing (cooling added though)	2012

Energy Conservation Projects continued			
Facility	Community	Description	Service Date
Mackenzie Mountain School	Norman Wells	HVAC Retrofit/mid-life retrofit	2012
Angik School	Paulatuk	Lighting Upgrade, Efficient Motor Replacement, efficient plumbing fixtures	2012
Chief Sunrise School	Hay River Reserve	DDC Upgrade, Ventilation Upgrade	2013
Helen Kalvak School	Ulukhaktok	DDC Upgrade, Gym Lighting, lighting upgrade, exit lights	2013
Diamond Jenness School	Hay River	Mid Life Retrofit	Winter 2013
Chief Jimmy Bruneau	Behchokǫ̀	Heating Network Optimization, ventilation optimization	2013
Inuvik School Replacement	Inuvik	Analysis of savings from Replacing the SAM and SH Schools in Inuvik	2013
Steam Heating Plant	Fort Simpson	Boiler Plant Optimization	2010
Central Warehouse	Yellowknife	Retrofit	2009
NSRO	Yellowknife	Retrofit	2009
Mezi School	Whati	Residual Heat Project	1983
Echo Dene School	Fort Liard	Residual Heat Project	2012
Chief Julius School Waste Heat	Fort McPherson	Residual Heat Project	1998
N'Dilo Gym	Yellowknife	Retrofit	2009

Electric Heat Conversions			
Facility	Community	Description	Service Date
JBT Elementary & Breynat Hall	Fort Smith	Electric Boiler Installation	2008
DOT Maintenance Garage	Fort Smith	Electric Boiler Installation	2009
Northern Lights Extended Care	Fort Smith	Electric Boiler Installation	2012

Biomass			
Facility	Community	Description	Service Date
North Slave Correctional Facility	Yellowknife	2 x Binder 750 kW	2006
Sir John Franklin School	Yellowknife	Binder 750 kW	2008
Kalemi Dene School	N'Dilo	3 x Bosch 23 kW	2009
Chief Jimmy Bruneau	Behchokǫ̀	KOB 750 kW	2009
St. Joseph School	Yellowknife	KOB 540 kW	2009
Legislative Assembly Building	Yellowknife	Binder 300 kW	2010
Highways Maintenance Garage	Hay River	KOB 260 kW	2010
PWK School & Recreation Complex	Fort Smith	KOB 750 kW	2010
Thebacha College	Fort Smith	KOB 750 kW	2010
Central Heating Plant	Hay River	KOB 1MW	2010
Health Centre	Fort Smith	KOB 750 kW	2012
Central Heating Plant	Fort Simpson	Combustion Experts 823 kW Steam	2012
Elizabeth Mackenzie School	Behchokǫ̀	KOB 500 kW	2013
Combined Services Building	Yellowknife	KOB 500 kW	2012
Deh Gah School	Fort Providence	KOB 300 kW	2013
Health Centre	Fort McPherson	District Heat System	2013





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